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A systemic approach to resilience and ecological sustainability during the COVID-19 pandemic: Human, societal, and ecological health as a system-wide emergent property in the Anthropocene

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ABSTRACT

The COVID-19 pandemic has caused a worldwide disruption. Most people have never witnessed such a global threat, and the world's leaders have not dealt with a crisis of this magnitude; moreover, Research & Innovation (R&I) teams have little time to invent new pharmaceutical therapies. Nations are trying to implement controlling strategies for avoiding significant losses, but this pandemic has already imprinted itself upon their citizens' psyche, created social anxiety, and disrupted national economies. The complexity of the psychological, social, and economic interrelations of this new source of stress cannot be appropriately understood by scientific reductionism and specialised thinking only. It needs to be considered how the current pandemic links to questions of ecological sustainability and resilience. Further, we must rethink the complex interactions of human-nature health that drove the crisis, as proof of an unsustainable human civilisation. Accordingly, this paper aims to contribute to the transdisciplinary resilience dialogue on the health maintenance and life-supporting processes of the biosphere by focusing on the COVID-19 crisis. It explores various frameworks that are contributing to the transdisciplinary meta-perspective of resilience. Moreover, it proposes a humanistic approach based on not only controlling strategies involving containment and social isolation but also the ecological balance considering the human, societal, and ecological health as a system-wide emergent property. Conceptual frameworks of resilience are discussed—as mapping methodologies to structure the discourse—focusing on the role of leadership and empowerment. Furthermore, some positive insights are discussed, as a transdisciplinary integrator and solidarity facilitator of coping, mitigation, and decision-making in the time of uncertainty and anxiety created by the COVID-19 pandemic.
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1. Introduction

Systemic health is a scale-linking emergent property of healthy interactions and relationships within complex dynamic systems [1]. Global risks threatening human health are intensifying due to environmental fragilities and technological unsustainability, along with social and human vulnerabilities. Some years ago, the United Nations (UN) Agenda 2030 for Sustainable Development (SD) had recognised the importance of transforming societies through sustainable, resilient, and inclusive paths that encompass the interlinked and universal Sustainable Development Goals (SDGs). Target 1.5 represents the core resilience, as mentioned in the UN report. Although fostering resilience requires a holistic and integrated approach to the SDGs [2], this new adversity presented in the form of COVID-19 has created a public health emergency that requires swift responses and changes.

Given its rapid spread, the World Health Organization (WHO) has declared the novel coronavirus (2019-nCoV) as a public health emergency of international concern. Many governments are planning approaches for emergencies that include measures of identifying infected people, isolating them, and subsequently tracing those they have had contact with during their illness. Finally, for most of the planet, central strategies of containment and isolation

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are the controlling strategies that have been implemented. Most businesses and governments are not prepared for potential prolonged impacts on staff welfare, operations, and supply chains, and they need careful planning to help them restart.

In mitigating the impact of the coronavirus, uncertainty and anxiety abound. This underscores the need for communities and the economy to be more resilient and united. Leaders, governments, companies, universities, and society urgently need to review their level of resilience to hazards; notably, these entities need to develop crisis response strategies and plans. Moreover, academics and decision-makers from various disciplines and sectors should discuss how to boost resilience in the face of ecological, socioeconomic, and political uncertainty [3].

1.1. Scope and objectives of the study

With the hazardous COVID-19 pandemic, it becomes evident more than ever that a new global environment is shaping. Over 10,000 virus-related deaths have been announced by the WHO thus far (7 April 2020), which underscores the social-psychological-economic-political realities of the global societal disruptiveness of the new coronavirus. Managing this new global threat strains not only the coping approaches of individuals and communities but also the capacity of the world itself.

Despite all of its negative aspects, the COVID-19 crisis may provide an opportunity for changes. This is because the pandemic can bring about some positive/humanistic insights, where specialised scientific knowledge and technology are only part of the answer.

The author of this paper aimed to contribute to the discourse of resilience for individuals and society as well as the global resilience perspective during this time living under the coronavirus. In general, the author also considers the systemic view of life and the interconnectedness of humans and nature under other extreme events.

In the resilience discourse, the individual is perceived as being immersed in the resistance to overcome their limits regarding suffering, fear, anxiety, and uncertainty. Accordingly, nations are perceived with smart and capable leadership for planning and implementing strategies for the mitigation of a hazard, while based on scientific interdisciplinarity and knowledge. In this articulation of resilience, the self is undifferentiated from nature. This perspective implies that resilience planning must integrate natural and social capitals, ethics, and values as agencies.

Within the domain of ecological-social research, future perspectives should be based on the nature-human system interconnectedness and interdependence. Solidarity, collaboration, awareness, consciousness, responsibility, and global capacity should be the agencies of increased resilience.

2. Methodology of the study

The author of this article sought to contribute to the gathered evidence by using some of the latest scientific findings and knowledge about COVID-19. This was accomplished from searches of bibliographic databases, searches of the tables of contents of relevant journals, and building upon information of other relevant articles. The entries may not be exhaustive, but new research and studies will be added regularly every day. This is because the COVID-19 outbreak is an ongoing event characterised by uncertainty for the future, and knowledge on the mechanisms of the disease and its fearful, active contagiousness is limited.

By taking an empirical and intuitive approach to the resilience principle and combining the experience for climate change risks and hazards that people have globally witnessed during the last few years, a tailored methodological approach was designed and adjusted to the special case of COVID-19. This approach was based on the specific characteristics of the local, national (Greek), regional (Mediterranean), and global societies.

Reflecting on the concept of the resilience of an individual who needs to be strong physically and mentally to overcome the adversity through containment and isolation, the author developed a framework of structural changes that could empower individuals, societies, and nations. The author considered societal and individuals' resilience as functions of the social-ecological system—that is, a system of people and their environments with complex interactions.

Further, the author established the framework for the methodological approach for the dialogue on resilience by focusing on necessary coping changes, new knowledge required, the differentiated vulnerability, and relevant philosophy as the supporting objectives. The author proceeded in three steps, first descending from problem definition and objectives to theoretical frameworks and backgrounds and subsequently towards more oriented reflections that looked at the individual through an empirical psychological and philosophical lens (Table 1).

3. Conceptual frameworks

The main pillars of resilience are the vulnerability and ability to deal with situations of extreme adversity [4]. The author considered societal and individuals' resilience as functions of the social-ecological system and started the study with some conceptual frameworks as mapping methodologies to structure the discourse of resilience. There was a focus on the role of leadership and decision-making in the time of uncertainty and anxiety created by the COVID-19 pandemic and an environmental crisis in general. These frameworks are presented in the following four sections.

3.1. Risk, hazard, vulnerability, and exposure frameworks

Risk is defined as the possibility of adverse effects in the future with the probability of loss in terms of human lives, economic assets, environmental resources, cultural values, and critical infrastructures due to an unexpected and destructive event [5]. Furthermore, risk is defined by a mathematical function of hazard, exposure, and vulnerability: *Risk = Hazard*Exposure*Vulnerability* [6].

Disaster risk is expressed as the likelihood of loss of life, injury, and damage from a disaster in a given period [7]. A hazard is produced by a phenomenon having the potential to cause harm or other undesirable consequences to some persons. The magnitude of the hazard is the resultant amount of harm, which includes the number of people or things that were exposed to it and the severity of the consequences [8]. Exposure represents the stock of property and infrastructure exposed to a hazard, including socioeconomic factors [8].Vulnerability is the state of susceptibility to harm from exposure to stresses associated with decreases in health, death, environmental damages, and negative social changes due to the absence of the capacity to adapt [9]—from local to international scales [10].

3.2. Coping, adaptation, and mitigation frameworks

Coping is a key component of the resilience process; moreover, it is a universal human activity and experience [11]. The ability to deal with adversity (coping) is described as the set of strategies used by individuals to adapt to adverse or stressful circumstances [6]. Adaptation is a complex concept that primarily refers to the limits to physical adaptation and sociopolitical or cultural

Table 1
Methodological questions for the resilience dialogue.

Context	Questions
Extent	- To what extent can/does the individual cope? - Under which circumstances?
Change	- Is resilience based on a structural or individual change or both? - What changes the individual and the society need to achieve to overcome this adversity?
Knowledge	- What knowledge is needed to be more resilient at the individual and leadership levels?
Values	- Which values will we choose to drive economic, political, and individual choices?
Vulnerability	- Is there a differentiated vulnerability among people?
Philosophy	- Can philosophical/spiritual approaches/practices increase the individual's resilience and self-healing?
Consciousness	- Can we help ourselves to remain strong facing the adversity by extracting courage and wisdom from within? - What truths from our unconscious do we need to recall? - Can the human-ecological interconnections' awareness make us more resilient and responsible?
Science	- Whom and what can we trust in coping with the hazard?
Leadership	- What kind of leadership is needed?
Post-hazard time	- Can societies and economies restart after the lockdown?

adaptations [5]. Mitigation is about reducing the causes of the hazard, while adaptation concerns adjustments to the consequences for ecosystems and human life [12].

3.3. Resilience frameworks

Resilience is an interdisciplinary concept that has been contextually developed in several disciplines that provide a variety of concepts. The term resilience emerged in physics and engineering as the concept of elasticity in materials science. In psychology, the term resilience is defined as a cognitive and behavioural effort [4]. Neurolinguistics consider that there is no failure and that there is only a feedback of self-organising systems seeking a state of balance and stability [13]. Spiritual resilience is defined as the ability to sustain one's sense of self and purpose through beliefs/principles/values whenever encountering adversity, stress, and trauma; conversely, coping shows a strong relationship to positive adjustment after crises [14]. Ecological resilience is defined as the persistence of relationships within a system and the ability of these systems to absorb changes and return to an equilibrium state after a temporary disturbance [15]. Resilience to climate change disasters refers to the adaptation and recovery from hazards; accordingly, it starts with disaster risk assessment, planning, and reduction [16].

The studies on resilience are grouped into many generations, along with time evolution. The first generation defined resilience as '*the adaptability of the individual, who is able to handle and overcome an adversity*'. The second generation added the term '*positive adjustment*', favouring individuals to be stronger and productive, with positive psychology subsequently emerging [17]. The third generation added the notion of '*a transformative change*' [18,19]. The fourth generation investigated the critical issues of '*equitable resilience*' for engaging with equity in resilience practice [20].

Resilience also has a gender and urbanistic dimension. There is a broad understanding that gender inequality is a fundamental part of increased resilience to disasters [21]. Women are more affected by them, as they constitute most of the world's population [5,22,23], and they are more dependent for their livelihoods and children's lives when under threat [24].

Resilience is also an important goal for cities/megacities because urban regions face a growing range of adversities and challenges in the 21st century. Urban resilience is the ability or capacity of a city to survive and thrive in any kind of a disaster [3]. Urban areas, cities, and megacities are facing the challenges of a single shock and the accompanying stress as well. Chronic stresses are slow-moving disasters that weaken the fabric of a city (unemployment, migration, etc.), and most cities face a combination of these challenges. With the COVID-19 situation, every city around the globe is facing a combination of many challenges, with this pandemic being their primary concern.

4. Discourse of a systemic resilience

It is difficult to understand the causes and dynamics of pandemics, such as the present COVID-19 situation. It is a big challenge to properly evaluate the benefits and risks of selected options to mitigate the risks, especially because time is an urgent parameter. For decision-makers, understanding the risks is not sufficient. Scientific, technological, and organisational knowledge, along with ethical responses, is necessary for informed choices that respond to many cognitive questions [8]. These factors are also helpful when looking at systemic health as a scale-linking, emergent property of healthy interactions and relationships within complex dynamic systems [25].

The term '*risk control assessment*' is used to describe the alternative interventions to reduce or eliminate a hazard that the state or organisations have to resolve. These interventions involve the choice of alternative processes/actions that might prevent or reduce exposure or mitigate the consequences [26]. In the case of COVID-19, the interventions involve actions that are designed to reduce human exposure to it. Enhancing the capacity of clinics and hospitals, the strict quarantine of infected patients, and campaigns for hand washing and cough etiquettes are commonly used programmes [27]. As the pandemic grows, governments and communities are not only struggling to minimise the loss of life and protect their fragile healthcare and economic systems but also wrestling with questions about how we can recover when this pandemic passes.

In this study, the author advocated that society must go beyond the '*control of the risk*' approach in planning and implementing strategies to cope with the hazards. This is accomplished by considering diverse organisational, cognitive, philosophical, and ethical frameworks for the resilience of individuals and societies as preventive agencies in promoting structural and cultural transformations. This pandemic is revealing systemic environmental, energy, economic, and political challenges; therefore, we must have concepts to be based for the discourse of a systemic resilience.

The theoretical concepts of which the author is focused upon are depicted and discussed in Table 2 below.

4.1. The systems view of life

Many regions in the world have been undergoing profound transformations that affected the global climate and created hazards that increased the vulnerability of their populations. However,

Table 2
Theoretical concepts considered by the author for a systemic resilience.

I. The systems view of life.
II. Uncertainty of life.
III. Complexity of knowledge.
IV. Interdisciplinarity-transdisciplinary.
V. Leadership intelligence.
VI. Ethical principles.
VII. Healing of the planet.
VIII. Inner wisdom.
IX. Philosophical and spiritual healing.

the vulnerability, resilience, and well-being of any society is dependent on the acquired knowledge of its members [28] and the dynamic interconnections of the web of life [19]. Beck [29], in his 1992 book, *Risk Society: Towards a New Modernity,* focuses on questions of uncontrollability, ignorance, and uncertainty in the modern age. He has defined risk as a systematic way of dealing with hazards and insecurities induced and introduced by modernisation itself. Ignorance can be described as a lack of knowledge, but the sociology of scientific ignorance refers to the ignorance of scientific research and the public ignorance of science [30]. Uncertainty refers to epistemic situations involving incomplete or unknown information to predict future events in many fields [31].

Based upon the systems view of life understanding, resilience is defined as a '*unifying concept in both ecological and social systems*' [32]. Capra and Luisi (2014) [19], discussed the *'systemic thinking'* and the implications of the systems view of life with regard to the global ecological and economic crises. Kuenkel (2017) [33] advocated that the transformative changes that can result from the implementation of the SDGs should be built upon a systemic transformation to enhance aliveness and safety in socio-ecological systems. To build resilience, the systems must be designed and function in a way that they can withstand, respond to, and readily adapt to shocks and stresses [26].

Notably, the COVID-19 pandemic revealed that societies are not prepared to anticipate and cope with disease risks.

4.2. Uncertainty of life affecting various mental decisions and proposals

For most people, the idea of the coronavirus expanding to pandemic dimensions is anxiety-inducing due to the fear for their health and future. Furthermore, another overwhelming layer of stress can be added to people already facing other stresses, such as economic issues, trauma, health problems, migration, displacement, war, etc. It has created uncertainty, which is intrinsic to the human condition and two-faced, including the objective uncertainty and the subjective uncertainty, affecting various mental decisions and proposals, as depicted in Fig. 1.

For individuals who have experienced trauma, the lack of control and feelings of powerlessness are particularly difficult. Trauma refers to experiences that cause intense physical and psychological stress reactions, such as an exposure to a potentially life-threatening event or witnessing something that was emotionally harmful [35]. These experiences threaten the individual's functioning as well as their physical, social, emotional, or spiritual well-being [35].

4.3. Complexity of knowledge to face the global ecological problems in the anthropocene

In the era of the Anthropocene, we are facing the global problems of environmental damage and economic cynicism. The exponential increasing demand for goods, services, capital, and data have increased uncertainty and complexity. The waves of border crossings have resulted in an increasingly interdependent and interconnected global economy that requires societal leaders to be able to address the impact of uncertainty and complexity on governance and consider a systemic risk management plan [36].

Some risks are difficult to control or are uncontrollable, such as the case of COVID-19. In the context of uncontrollable risks, to understand the difference between a complicated and complex system is essential, especially when examining risk management and governance responses/decisions. The Organisation for Economic Cooperation and Development (OECD) and the World Economic Forum (WEF) emphasised that these risks are systemic in nature [36], and their behaviour follows a precise logic and repeats itself in a patterned manner [37].

Due to globalisation, the increased connectivity enables and creates systems that are globally integrated but also inherently complex, thus requiring a more transparent and resilient globalisation [38]. Society is also a complex system driven by emotions (the human component), infrastructure, and environment; therefore, solving the 21st century's problems requires a knowledge that is complex. The problem of the complexity of knowledge by modern science was raised by Bachelard (2002) [39], who argues that *'the scientific mind must be formed by being reformed'*, implying that far from being completed and established, the formation of the scientific mind is an ongoing process.

4.4. Interdisciplinarity and transdisciplinary knowledge for informed choices and proposals

In the process of implementing the SDGs, it is essential that we understand the interactions among targets that require valuable interdisciplinary information. However, the ability to maintain a holistic view of the system is also required, as some policy changes may change the dynamics of the entire system [40].

Interdisciplinary knowledge is necessary for informed choices and proposals, for coping quickly with an adversity that is taking on global dimensions, like the COVID-19 pandemic. Interdisciplinarity is understood not only as a connection of fields of knowledge but also as a way to regard the individual as full of possibilities [41,42].

Transdisciplinarity considers science as focused on the subject—not on the object—and being an approach to inquiry beyond dualism, integrating the knower and the process of knowing, proposing a new type of intelligence that reflects harmony among mind and body [43]. Sensibility to interdisciplinarity and complexity can form environmental transformation processes. The perspective of the complexity and circularity of systems should be considered to go beyond traditional reductionism [44] as a mode of knowledge integrating the principle of connectivity [42].

In the case of systemic hazards that are complex phenomena, it is often impossible to gather all of the necessary knowledge. A well-informed mitigation proposal requires multifaceted knowledge [8], with the following facets briefly depicted below in Table 3.

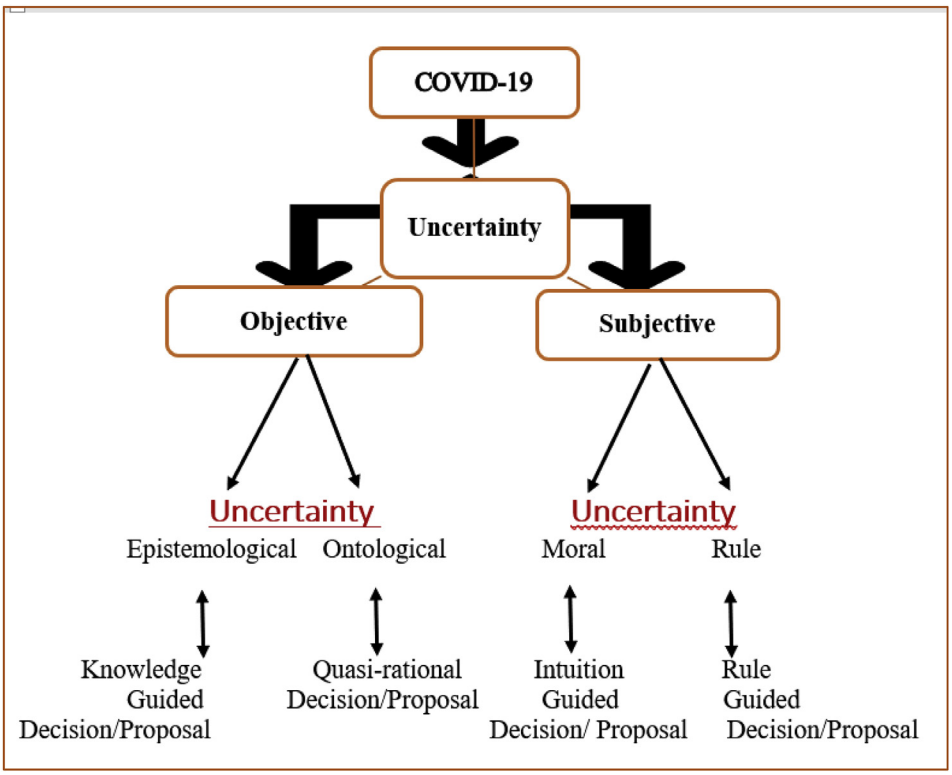


Fig. 1. Uncertainty affecting various mental decisions and proposals [34].

Table 3
Complex knowledge required for hazard planning-making [8].

✓ Knowledge of ecological and societal risks and benefits associated with a plan.
✓ Knowledge of alternative options, their complexity, risks, and benefits.
✓ Estimation of the uncertainty and complexity of the relevant information.
✓ Scientific expertise and collaborative knowledge.
✓ Knowledge of new technologies for effective governance.
✓ Big data and information technology knowledge limited for uses during the hazard.
✓ Understanding the multifaceted holistic resilience.

4.5. Leadership's intelligence to work with complex systems

Leadership intelligence, expertise, and the ability to work with complex systems are necessary to integrate the above knowledge, data, and technologies in an interdisciplinary approach [36]. In times of hazards like the COVID-19 pandemic, leaders are the navigators and captains of an ongoing journey. They are expected to be able to identify the problem, establish options, develop an action plan, execute it in time, and communicate the idea to the public through media. For all of the abovementioned, they need to understand the ongoing mechanisms for achieving clarity about the current situation and desired outcomes. They need to be responsible to cultivate cognitive complexity by embracing intelligence frameworks [45]. These frameworks can help them generate the real power of smart leadership, as depicted in Table 4.

4.6. Ethical principles to combat crises

Risk management choices involve risks and benefits not only to human health, safety, and life but also to the nonhuman organisms, non-human communities, and ecological balances along with political and religious values. In the case of COVID-19, which is a known-unknown threat, the consequences of the complex linkages *of ecology-society-economy* are particularly challenging in the context of national, regional, and governance responsibility. Ethics are important because it is a philosophical technique that can help having a broader view of what are the causes and consequences of a hazard and how to react and act accordingly [46]. However, the problem is not to see the causes and consequences of a hazard but to notice the huge gap between our ethical judgments towards a crisis. We must shape our ethical responses according to these judgments, which cannot be bridged only by the enhancement of knowledge [47].

The industrial society has constructed the productive power that is correlated to the productive subject. In the Anthropocene, with materiality being the essence of existence, the '*homo industrialis'* used to '*heat, beat, and treat*' the earth for the extraction of resources, production of materials as well as the wasting of resources [48].

Ethical principles are necessary to combat crises. The COVID-19 pandemic is the '*perfect moral storm*' for these three reasons [49]: a) it is a truly global phenomenon, b) it has intergenerational effects, c) our theoretical and managerial tools for anticipating and managing, such as intergenerational ethics, are underdeveloped.

The ethical principle of equity and justice should be the core of the decisions and actions for the COVID-19 pandemic because the

Table 4
Intelligence frameworks for smart leadership.

	Skill	Question	Methodology
Contextual intelligence			
Framework	*Understanding Framework the context*	*Where are we and where do we wish to go?*	Facing the pandemic, leaders should understand its context with clarity by listening, feeling, and sometimes using intuition to catch the reality and generate perspectives based upon active listening. Furthermore, they should be willing to anticipate extreme scenarios supported by meaningful foresight processes. This clarity of context is essential for taking relevant action. This is contextual intelligence.
Moral Intelligence			
	Having a moral code	*Why?*	They need to articulate and disseminate values and a sense of purpose that justifies the sacrifice of people for the common good.
Emotional intelligence			
Framework	*Showing social and emotional intelligence*	*How?*	Social and emotional intelligence expresses values in interacting with and influencing others. This connection is through our empathy and compassion helps leaders and us to communicate in ways that are credible and trustworthy which consider the social and emotional aspects of the society. This enables smart collaborative decisions and self-development.
Generative intelligence			
Framework	*Creating solutions*	*What solutions?*	They are expected to generate solutions, by implementing innovation processes to develop new ideas and develop them into meaningful solutions on a timely basis and with full appreciation of diverse opinions and expertise.
Technological intelligence			
Framework	*Embracing technology*	*What technological solutions?*	They need to embrace new technologies in reshaping society's institutions. These innovations include remote learning, new healthcare delivery systems, collaboration, new distribution channels for needed resources, etc.
Transformative intelligence			
Framework	*Driving transformations*	*What do we wish to achieve?*	This is an ability to create and drive a meaningful roadmap with clear, credible communication and to motivate people to take action. Leaders are expected to drive transformational agendas by creating trust, cultivating feelings of caring and safety, using narratives to engage others in achieving a desired outcome, and expressing a purpose that is shaped by a set of values and responsibility.

ethical dimensions of our choices for growth and development lie at the core of our dynamic interconnectedness [46].

4.7. Healing the planet

During the last decades of the 20th century, humanity has exceeded the earth's carrying capacity (biocapacity) (Fig. 2). This economic growth has caused the rising existential crisis, and consequently threatening humanity's survival. The Intergovernmental Panel on Climate Change (IPCC) is currently in its sixth assessment cycle and is planning to produce three special assessment reports which are due for release in 2022. The IPCC synthesis report (AR6 SYR) will be based on the content of the three working groups assessment reports that are devoted to the impacts, adaptation and vulnerability, and mitigation of climate change [50].

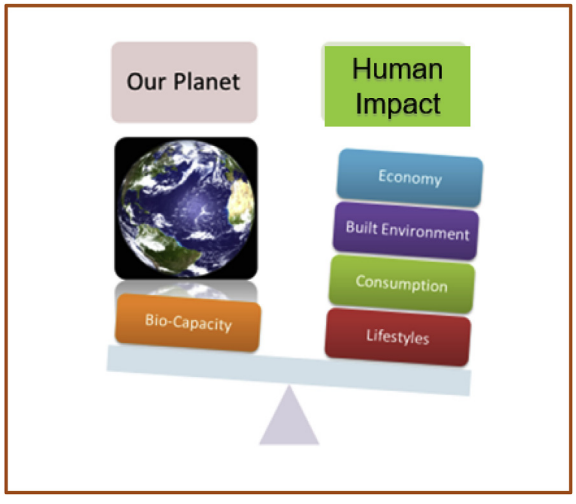


Fig. 2. Schematic representation of our planet's biocapacity and the human impacts on earth's carrying capacity.

Notably, while it is not yet 2022, nature is already sending us a message with the COVID-19 pandemic. We need to decode this message. According to the UN, the ongoing climate crises are due to the fact that humanity has placed too many pressures on the natural world with damaging consequences [51]. Therefore, understanding the whole human-nature system and how the planet functions is of primary importance [19].

According to Heisenberg (1971) '*the world appears as a complicated texture of events, in which connections of different kinds alternate or overlap or combine, determining the texture of the whole*' [52]. International economists [38] stated that the world should be defined as a complex system needing reforms to promote a more transparent and a more resilient globalisation, while increased connectivity enables and creates systems that are globally integrated.

Our planet is a self-organising, self-regulating biosphere. The natural world and human activities are totally interconnected and interdependent. Climate change has disturbed the earth's physical systems; in turn, these disturbances create direct and indirect risks to human health [53]. Deforestation and massive intrusions into other ecosystems have fragmented the self-regulating ecosystems and disrupted the web of life. There have been many consequences from these actions, and among them is the global COVID-19 pandemic we are facing now. The coronavirus and other viruses were living in symbiosis with certain animal species and now have jumped from those species over to humans [54a,b].

Healing the planet is not unrelated to healing our own anxiety and pain because the pain of the earth and that of people are interdependent. Thus, the healing of our individual suffering can become the basis of the healing of earth.

4.8. Inner wisdom through introspection

Awareness overcoming the cognitive limitations and incorrect assumptions and ideologies that have resulted to the crises of the 20th century is very quickly being questioned due to the threatening COVID-19 pandemic.

New awareness can come from both outside and from inner

processes. Introspection regarding awareness, strength, and tranquillity searching from within, in the period of crisis, plays an important role. It can also play an important role in the societal processes of resilience, as an emergent process for the reallocation of the relations of humans with nature and shifting the implications of the Anthropocene [55].

Introspection can help us to create self-consciousness; in fact, consciousness is the highest level of human mental activity and one of the basic concepts of philosophy, psychology, and sociology. Its unique characteristic lies in a reflection of reality, and its constructive-creative transformation in the form of sensuous and mental images, concepts, and ideas. Moreover, it helps to anticipate practical action with meaning and vision by individuals and social groups [56]. Looking to create consciousness means exploring a very complex and multifaceted topic [55]. Le Doux (2015) [57] has described the autonoetic state of the individual as a sort of metacognitive awareness—or a higher-order awareness, a thought on themselves [55]. Human consciousness emerges at the interface between components of communication and the use of tools. Sigmund Freud (1963) [58] considered the consciousness's fundamental dynamic nature coming together with its dimension of depth (or hierarchy) in the mind [59]. According to him and other contemporary psychotherapists [60], bringing the autonoetic components stored in the unconscious into consciousness is a fundamental step of the process of psychological healing. This autopoietic ability of the individual cannot be controlled from outside and so it must be directed from inside [18]. Capra (2014) [19] used the term '*uncommon wisdom*' in reference to an extraordinary reservoir of power, love, and wisdom within us.

Technological progress without sustainability along with the dominant ideology of the profit principle increased the disturbances of ecological systems and the ecological consciousness of people. The transition to ecology for healing the planet is seen as a fundamental comportment of self-esteem, respect, and a broader connectedness, [61,62].

The current health crisis is, therefore, a clear call to transform our awareness and lifestyle [63].

4.9. Philosophical and spiritual healing

Nature-centred spiritual traditions/practices and philosophies have many lessons concerning the relationships between humankind and nature [64]; thus, human societies worldwide have developed interpretations of their interactions with nature [65]. Philosophers have made certain fundamental assumptions through culture, science, art, spirituality, ethics, and politics and have been successful in interconnecting them with life [18].

From Aristotle to Heidegger [66], the sense of being evolved through the logos, which is the art for the presence of something to existence occurring—whether in praxis or theory, assigning them meanings in relation to life. Considering the above, it is time to move from the '*homo industrialis*' to the '*eco-spiritualis*' that involves '*caring and loving*' and through consciousness and the responsibility to take decisions for humans and nature [67].

Although interventions targeting spirituality or religious beliefs are difficult to evaluate, studies have been conducted on spiritual practices such as mantra repetition and transcendental meditation [68,69]; furthermore, there have been studies concerning reducing anxiety and stress [70]. Researchers argue that spirituality is starting to be a collective practice rather than an individual's search for meaning. They have also identified spirituality in health research contexts as a tool for closeness and emotional exchanges [71] and for decreasing stress [72]. In particular, Zen is a spiritual path that leads to healing in the personal, social, and ecological dimensions [73].

As a clinical intervention, mindfulness meditation has been demonstrated to have beneficial effects on improvement of mental and physical states [74]. The core concepts of mindfulness include paying attention to the present moment and attaining a state of consciousness in a non-judgmental/accepting manner [75].

Evidence from the field of cognitive neuroscience suggests that long-term involvement in meditation decreases the reaction intensity of the autonomic nervous system [76] and may also increase cognitive flexibility [77] and produce positive effects on emotion-cognition interactions [75]. Zen is advocated by the writers as a spiritual path that leads to healing in the personal, social, and ecological dimensions [73].

In order to heal people from COVID-19, it is natural to expect that the anxiety should be alleviated together with the advances of modern medicine with regard to therapeutic technologies that detect and treat this disease. However, in the case of COVID-19, this is not yet possible, since medical therapies and vaccines are still being investigated and/or are in early stages of being tested.

5. Discussion and positive insights gained from COVID-19

The COVID-19 pandemic has brought a wave of negative outcomes such as illness, death, fear, and anxiety to people, but it is also highlighting some important life lessons. These are the lessons individuals and communities could learn at national and local levels.

The COVID-19 situation is teaching people about the importance of structural and personal preparedness, awareness, consciousness, and ethical responsibility for an increased resilience to hazards. It is also helping people to think differently about their interrelationships with the ecosystems and with others. However, more importantly, it shows the impacts of the '*human-nature*' dichotomy of the Anthropocene era. Therefore, it calls for personal, societal, and global changes and transformations.

Some positive insights gained from the COVID-19 pandemic are analysed in the following seven sections.

5.1. Positive insight I: unravelling the link of resilience with the science and R&I

One evolving positive outcome of this pandemic is the hope for the enforcement of people's trust in science and that scientists are uniquely positioned to lead people out of the fear and to empower them with facts and trust [78]. In addition, another positive insight is the awareness that scientists can have contradictory points of view.

Scientists are designated experts for studying the world, while science defines its essential role in society. During the coronavirus threat, a trust in scientists and scientific knowledge was created along with a thinking that scientists can have contradictory points of view whether on the measures to be taken, the suitability of a given medication, or the timeframe of the clinical trials to be conducted 79,80. People trusting science can act as an antidote to fear [81]; simultaneously, people must give space to the evolving scientific truth. In the 20th century, knowledge is complex, according to Bachelard (2002) [39], while the scientific theory could not be proved but disproved or falsified according to Popper (2014) [80,82].

During the COVID-19 pandemic, the growing legitimacy that has been earned by the health professionals who lead the fight against the virus is a positive outcome for the shift towards responsibility and the values of professionalism. Doctors and scientists are apotheosised because they are trusted to be able to search for the therapies/vaccines and to heal affected people in the hospital. However, this has not been always the case throughout human

history. Most people are very open to trusting experts and science only when their lives are in risk.

While highlighting the essential role of the scientific community, a better funding for Research & Innovation (R&I) at the national and transnational levels is imperative. Strengthening basic research, enhancing the capacity to detect, respond, and ultimately preventing—or at least, mitigating catastrophes, such as pandemics—is very important for the gain of complex scientific knowledge [80]. The WHO stresses the need for R&I collaboration, to find fast scientific answers, thus outlining the support for R&I and trust to scientists. Funding for research and innovation must consider health and environment/ecology together, otherwise their separation is a dangerous delusion. Health entirely depends on the climate and the other organisms we share the planet with today.

5.2. Positive insight II: it takes a crisis to reveal gaps, discontinuities, and needs for reforms to promote a more transparent and resilient globalisation

Sometimes it takes a crisis to reveal gaps and discontinuities. This crisis highlights the need for reforms to promote a more transparent and a more resilient globalisation process [45]. The coronavirus pandemic has revealed how individuals and societies are challenged by the unexpected and the need to innovate. Governments are forced to choose between containing the spread of the virus at the cost of destroying the economy or tolerating a higher human cost to save the economy (e.g. Sweden).

During the COVID-19 crisis, decisions and reforms have gone very fast; accordingly, decisions that could normally take years of consultation are now taken within a few hours. New technologies are used under the pressure of events; moreover, changes in the application of new technologies in all levels of societies are rapidly changing. Many of these short-term emergency measures will be integrated in the future, and most likely will become an integral part of people's lives. That is why decisions and reforms during the time of emergencies should encompass science, psychology, ecology, ethics, values, equality, and democratic freedom.

5.3. Positive insight III: afford the heterodox views of professionals and people

The COVID-19 pandemic is a common threat that has far-reaching social, economic, and political effects. The decisions governments make will probably shape our healthcare systems and also our economy, politics, and culture for the future.

Exaggeration should be avoided in responding to the pandemic as accurate estimates of death risk have important implications for the projecting of eventual total loss of quality-adjusted life-years [83]. The scientific accuracy of the seriousness of the disease and infection rates as well as the strict containment policies of the governments are being questioned by different scientists, immunologists, lawyers, and many others. These individuals are fearful of the loss of constitutional democratic rights in the decision-making of the governments.

Concerns are expressed that the national isolations may increase the precautionary measures. Major decisions must be made amid high scientific uncertainty, as is the case with COVID-19—notably, without demonising professionals and citizens having heterodox views.

5.4. Positive insight IV: Democratic freedom, ethical leadership, responsibility, equity and wisdom

National borders must not become barriers hindering help across nations, while democratic values and freedom must be kept in place. People should re-evaluate their mental models and drastically change their way of living. The coronavirus pandemic is a major test of social responsibility, trust in healthcare experts, democratic values, and freedom.

In fighting the threat that is COVID-19, everyone is equal. Everyone has the same responsibility and shares many of the same risks. The key to success is to make everyone responsible and to get every unit involved and hold officials accountable.

Social distancing can be very difficult, but it can also be very positive for introspection and in reawakening or enhancing wisdom.

New approaches to leadership based on democratic values and wisdom must become the imperative scope for the future [84]. During the pandemic outbreak, many short-term emergency measures will become a fixture of life because entire populations need to comply with certain guidelines. People will follow the imposed guidelines and obey the central governments and international organisations who monitor people and punish those who break the rules via modern technology. In their battle against the coronavirus epidemic, several governments have already deployed new surveillance tools. There is a potential downside from the management of COVID-19 concerning the surveillance of people. The fear is that this would give legitimacy to a new surveillance system and that in the future both governments and corporations will use more sophisticated technologies to track, monitor, and manipulate people. Wisdom and responsibility are needed to avoid the deployment of mass surveillance tools in countries that have so far rejected them.

The coronavirus crisis must not reverse the big battle has been raging in recent years over our privacy [85].

5.5. Positive insight V: Sharing is caring, compassion, and global collaboration

Humanity is now facing a global crisis, and the decisions that citizens and governments make are likely to shape the world for years to come. This involves not just healthcare systems, but also economies, politics, ecology, and culture. In the face of this unprecedented situation, humanity cannot exist without a collective consciousness and without cooperation. The coronavirus pandemic is a global problem that can only be effectively overcome with global cooperation; furthermore, global cooperation is also vital from an economic point of view. But to do that, a spirit of global cooperation and trust is needed and countries should be willing to openly exchange information, seek advice, and trust the data and knowledge they receive. What should be avoided is each country trying to do this locally and storing what equipment it can obtain. Accordingly, a coordinated global effort could significantly accelerate production and ensure that rescue equipment is more equitably distributed. Under normal circumstances, the increasing interconnectedness of the world facilitates the exchange of ideas and information, leading to the enhancement of the prosperity and well-being of many nations.

The COVID-19 crisis should help to reshape the solidarity of the European Union (EU) among its members and affect the future of the European project. Pandemics represent a threat to the millions of refugees, migrants, other people displaced by the force of adversities along with the world's poor.

The global community must intensify efforts to protect the most vulnerable.

5.6. Positive insights VI: Credibility in communication

It is important that leaders and decision-makers maintain the public's trust with evidence-based interventions and fully

transparent, fact-based communication. The effectiveness and societal impact of quarantine and social distancing that are the target for the controlling strategies for COVID-19 depend on the credibility of public health authorities, political leaders and institutions, personal responsibility, and trust in governments/leaders.

Risk communications are designed to effectively communicate health risks to the public through national/international agencies. The messages must provide evidence-based information about factors/behaviours that are dangerous to people's health and make recommendations regarding how the risks can be mitigated. The organised communication must be designed to help to make people aware of the risks and to motivate them to act in ways that promote health or prevent disease. This particular form of communication must be based upon the best available scientific, technological, and organisational knowledge and skills. Moreover, it should be able to appropriately present the risks to the media, which can then effectively inform the public [86].

Furthermore, it needs people to be responsible and think about the larger context of the crisis. It should be recognised that this pandemic is interconnected to global systems and it could trigger massive changes in many dimensions of societies worldwide.

5.7. Positive insight VII: Prioritising targets and harvesting synergies with SDGs interactions

In the midst of the Fourth Industrial Revolution, and in the time of disruption, skills and models are required for developing new strategies and relevant communication methods. It requires agility, rapid innovation, and networked organisational designs and flows. It also needs prioritisation of targets because the implementation of SDGs is complicated by the fact that targets and goals interact and impact each other in different ways [2].

With the objective to enhance progress across all 17 SDGs, if systemic impacts are considered, interactions playing out are context specific. It is important for leaders to be able to utilise a systemic and contextual analysis which prioritises the efforts to enhance the effectiveness of implementation strategies. Therefore, gaining a systemic and contextual perspective on the SDGs can enable a structured way to document and code interconnectedness between SDG targets and resilience [40].

6. Recommended criteria for risk assessment and mitigation proposals in the context of resilience

Taking the above positive insights gained from the COVID-19 pandemic into consideration, some criteria are recommended for the assessments of the risks and benefits of all available options of facing an adversity, as depicted in the Table 5.

7. Conclusions

In this study, the author advocates that society must go beyond the '*control of the risk*' approach in planning and implementing strategies to cope with the hazards. Subsequently, the author suggests that organisational, cognitive, philosophical, and ethical frameworks as preventive agencies in promoting structural and cultural transformations for enhancing the resilience of individuals and societies should also be considered.

Conceptual frameworks of the discourse on resilience have been analysed by the author of this paper. They were done the objective to make meaningful clarifications that are applicable for enhancing the empiricism and rigor of this work based upon variables linked to knowledge and evidence.

Taking advantage of practices used in other countries helped the author to learn from the experiences of others. Yet, the lessons learned from COVID-19 are preliminary, because this hazard is an ongoing event. However, based on the open and broad international dialogue, some positive insights are shared.

The author has emphasised that facing epidemics and pandemics is filled with new and hazardous challenges for societies across the globe. In the current crisis, we are faced with two particularly important options of risk management: a) the one which concerns the total monitoring or empowerment of citizens; and b) the one which concerns nationalist isolation or global solidarity. Both methods will present their effectiveness with the end of the threat. Furthermore, it is essential that countries have effective and smart leaders with solid cognitive, emotional, moral, and technological knowledge to help them to construct prudent, effective, and objective plans that are equitably implemented among all levels of society. What is also important is to keep the democratic freedom of citizens and their personal data privacy intact.

The state as the collective expression of society to the extent that it can and does effectively function must create trust and safety that ensures its survival. A well-informed and self-motivated population is usually more resilient and more effective than a forcibly democratised and ignorant population. However, to achieve such a level of compliance and cooperation, people need to trust health care systems, authorities, and leaders.

The COVID-19 hazard increased people's awareness of the pressures that a virus can put on us and of the uncertainty that is intrinsic to the human condition. It also reminds people of the global stresses humans have created on the ecological systems, thus disrupting the balance of these systems. Moreover, a systemic approach to resilience and ecological sustainability is needed for enhancing the human, societal, and ecological health in the Anthropocene.

Finally, introspection and meditation can help to heal the stresses of the virus-caused hazards and create tranquillity for some people while increasing their psychological resilience.

Table 5
Recommended criteria for risk assessment and mitigation proposals.

1. Reliability and confidence of the available data
The accuracy or reliability of the data that are available is very important, because often there are insufficient data from which to confidentially extrapolate high quality estimations of risks (or benefits) for a whole population.
2. Choice of assumptions and models
When data are missing or uncertain, the assumptions and models used by experts to estimate the risks and benefits may contain hidden values of the existing ideologies.
3. Sensitivity of the estimates
The estimations depend on different plausible assumptions about exposures to hazards or benefits and on the method used for converting available data into estimations or prognoses. The choices of the methods are very important as they affect the decisions/proposals. This is also based upon the responsibility and values of the decision-maker.
4. Trust and confidence
The boundaries or confidence limits, within which the correct risks (or benefits) are estimated, are very important and are subject to ethical values and ideologies.

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Declaration of competing interest

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